Refine Search

Search Results -

Terms	Documents
L1 and ((portable or handheld or laptop) adj1 computer)	25

Database:
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Set Name side by side	Query	Hit Count	Set Name result set
DB=USPT,USOC; PLUR=YES; OP=OR			
L2	L1 and ((portable or handheld or laptop) adj1 computer)	25	L2
L1	dock$3 near10 (description or specification or kind) near10 (device or module or unit or (I adj1 O) or (input adj1 output) or peripheral)	123	L1

END OF SEARCH HISTORY

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Search Results -

Terms	Documents
L2	0

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DB=EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L3	L2	0	L3
DB=USPT,USOC; PLUR=YES; OP=OR			
L2	L1 and ((portable or handheld or laptop) adj1 computer)	25	L2
L1	dock$3 near10 (description or specification or kind) near10 (device or module or unit or (I adj1 O) or (input adj1 output) or peripheral)	123	L1

END OF SEARCH HISTORY

Refine Search

Search Results -

Terms	Documents
(708/139 |361/683 |361/729 |361/686 |361/727 |709/220 |709/250 |710/303 |710/300 |710/304 |710/302 |710/72 |710/104 |235/472.01 |235/472.02 |713/300).ccls.	7601

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Search: L4

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Search History

DATE: Tuesday, July 06, 2004 Printable Copy Create Case

Set Name	Query
side by side	
	DB=USPT,USOC; PLUR=YES; OP=OR
L4	710/303,300,304,302,72,104;709/220,250;713/300;361/683,729,686,727;235/472.01,472.02;708/
	DB=EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR
L3	L2
	DB=USPT,USOC; PLUR=YES; OP=OR
L2	L1 and ((portable or handheld or laptop) adj1 computer)
L1	dock$3 near10 (description or specification or kind) near10 (device or module or unit or (I adj1 O (input adj1 output) or peripheral)

END OF SEARCH HISTORY

h e b b cg b e e ch

Refine Search

Search Results -

Terms	Documents
L2 and L4	17

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- US Patents Full-Text Database
- US OCR Full-Text Database
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- Derwent World Patents Index
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Search: L6

Refine Search | Recall Text | Clear | Interrupt

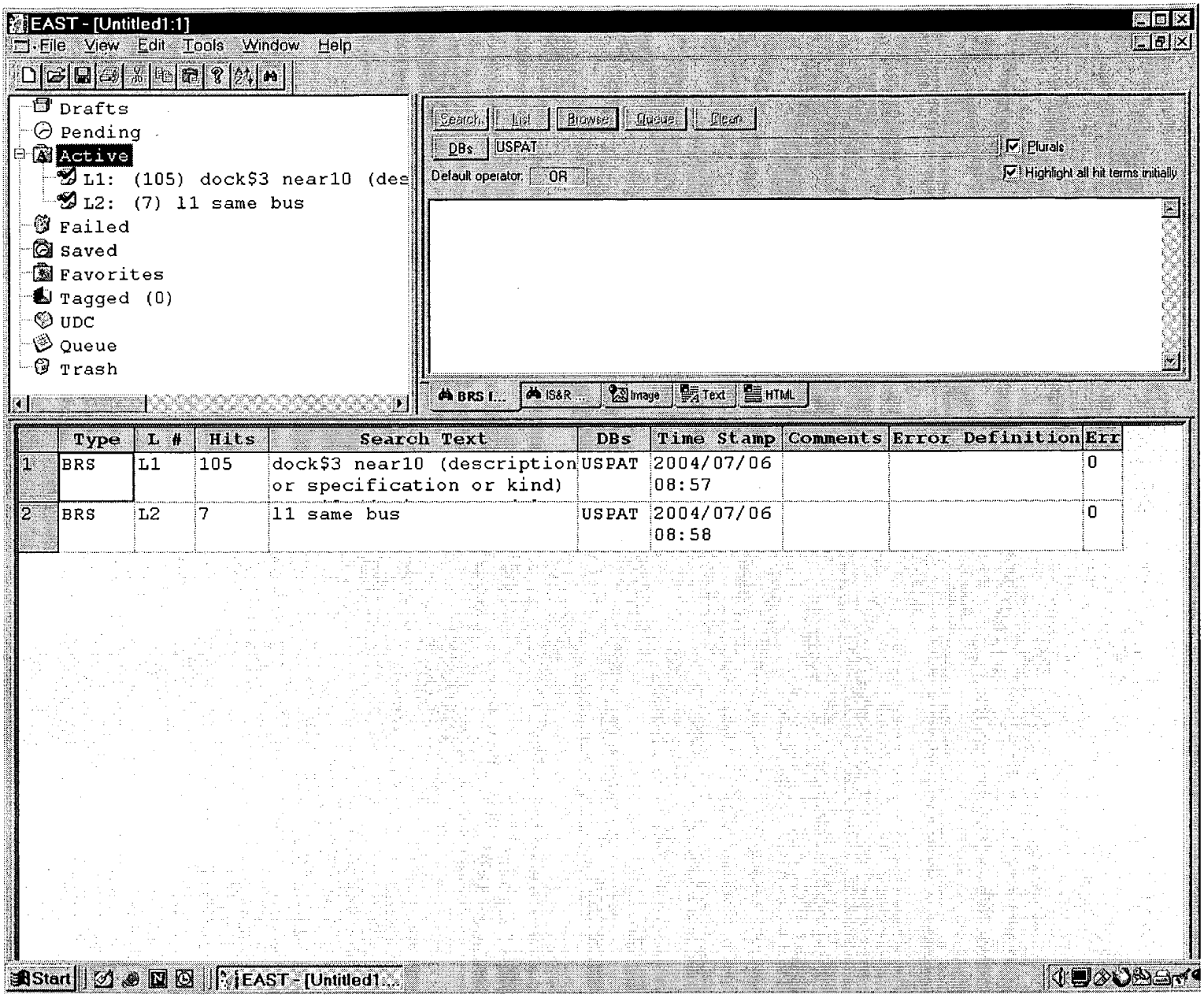
Search History

DATE: Tuesday, July 06, 2004 Printable Copy Create Case

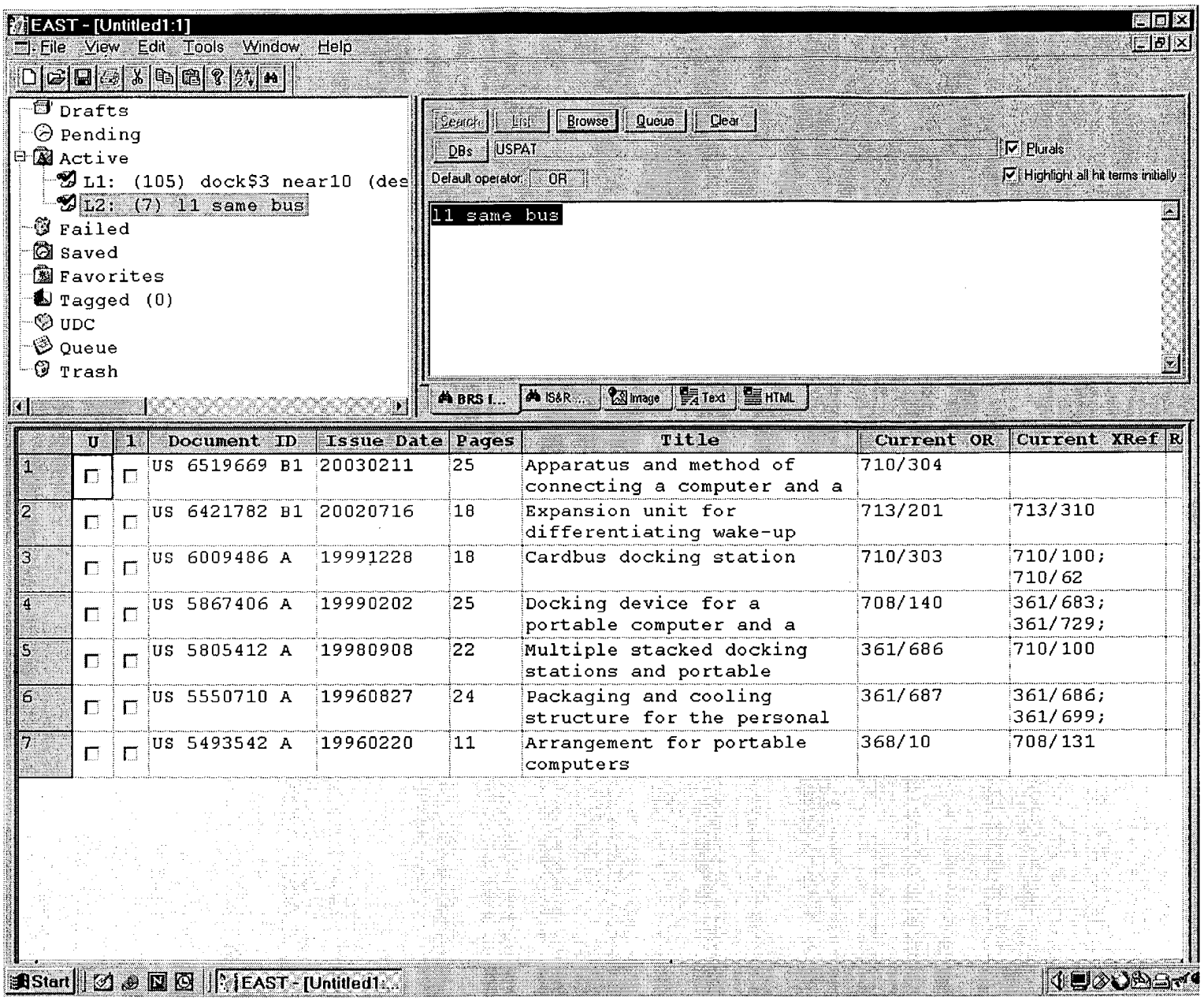
Set Name side by side	Query
	DB=USPT,USOC; PLUR=YES; OP=OR
L6	l2 and l4
L5	l1 and L4
L4	710/303,300,304,302,72,104;709/220,250;713/300;361/683,729,686,727;235/472.01,472.02;708/
	DB=EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR
L3	L2
	DB=USPT,USOC; PLUR=YES; OP=OR
L2	L1 and ((portable or handheld or laptop) adj1 computer)
L1	dock$3 near10 (description or specification or kind) near10 (device or module or unit or (I adj1 O (input adj1 output) or peripheral)

END OF SEARCH HISTORY

h e b b cg b e e ch



	Type	L #	Hits	Search Text	DBs	Time Stamp	Comments	Error Definition	Err
1	BRS	L1	105	dock$3 near10 (description or specification or kind)	USPAT	2004/07/06 08:57			0
2	BRS	L2	7	l1 same bus	USPAT	2004/07/06 08:58			0



	U	1	Document ID	Issue Date	Pages	Title	Current OR	Current XRef	R
1	☐	☐	US 6519669 B1	20030211	25	Apparatus and method of connecting a computer and a	710/304		
2	☐	☐	US 6421782 B1	20020716	18	Expansion unit for differentiating wake-up	713/201	713/310	
3	☐	☐	US 6009486 A	19991228	18	Cardbus docking station	710/303	710/100; 710/62	
4	☐	☐	US 5867406 A	19990202	25	Docking device for a portable computer and a	708/140	361/683; 361/729;	
5	☐	☐	US 5805412 A	19980908	22	Multiple stacked docking stations and portable	361/686	710/100	
6	☐	☐	US 5550710 A	19960827	24	Packaging and cooling structure for the personal	361/687	361/686; 361/699;	
7	☐	☐	US 5493542 A	19960220	11	Arrangement for portable computers	368/10	708/131	

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dock* and (description or specification) and compute Search

☐ Check to search within this result set

Results Key:
JNL = Journal or Magazine **CNF** = Conference **STD** = Standard

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1 **DOCKET: A CASE tool and method to support software system understanding and modification**
Layzell, P.J.; Freeman, M.J.;
Computer-Aided Software Engineering, 1993. CASE '93., Proceeding of the Si International Workshop on , 19-23 July 1993
Pages:221 - 229

[Abstract] [PDF Full-Text (808 KB)] **IEEE CNF**

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2 **Improved algorithms for synchronizing computer network clocks**
Mills, D.L.;
Networking, IEEE/ACM Transactions on , Volume: 3 , Issue: 3 , June 1995
Pages:245 - 254

[Abstract] [PDF Full-Text (1100 KB)] **IEEE JNL**

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3 **A router architecture for real-time communication in multicomputer networks**
Rexford, J.; Hall, J.; Shin, K.G.;
Computers, IEEE Transactions on , Volume: 47 , Issue: 10 , Oct. 1998
Pages:1088 - 1101

[Abstract] [PDF Full-Text (500 KB)] **IEEE JNL**

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4 **A framework for analyzing configurations of deployable software systems**
Heimbigner, D.; Hall, R.S.; Wolf, A.L.;
Engineering of Complex Computer Systems, 1999. ICECCS '99. Fifth IEEE International Conference on , 18-21 Oct. 1999
Pages:32 - 42

h eee e eee g e ch e ch e e c e e e c e

[Abstract] [PDF Full-Text (104 KB)] **IEEE CNF**

5 **Wideband passive mechanical mounting systems for disk drives on in rough seas**
Dennis, N.;
OCEANS '97. MTS/IEEE Conference Proceedings , Volume: 2 , 6-9 Oct. 1997
Pages:1488 - 1495 vol.2

[Abstract] [PDF Full-Text (708 KB)] **IEEE CNF**

6 **BE-viewer: vision-based navigation system to assist motor-impaire people in docking their mobility aids**
Sabatini, A.M.; Genovese, V.; Maini, E.S.;
Robotics and Automation, 2003. Proceedings. ICRA '03. IEEE International Conference on , Volume: 1 , 14-19 Sept. 2003
Pages:1318 - 1323 vol.1

[Abstract] [PDF Full-Text (514 KB)] **IEEE CNF**

7 **A novel system for underwater docking in difficult situations**
Xiaodong Wang; Qingxin Meng;
Computational Intelligence in Robotics and Automation, 2001. Proceedings 2(IEEE International Symposium on , 29 July-1 Aug. 2001
Pages:543 - 548

[Abstract] [PDF Full-Text (440 KB)] **IEEE CNF**

8 **Time-to-X: analysis of motion through temporal parameters**
Burlina, P.; Chellappa, R.;
Computer Vision and Pattern Recognition, 1994. Proceedings CVPR '94., 1994 Computer Society Conference on , 21-23 June 1994
Pages:461 - 468

[Abstract] [PDF Full-Text (592 KB)] **IEEE CNF**

9 **The importance of fractal phenomena to information decision-actio systems**
Anthony, R.W.; McBryde, D.G.; Dockery, J.T.; Woodcock, A.E.R.;
Information-Decision-Action Systems in Complex Organisations, 1992., International Conference on , 6-8 Apr 1992
Pages:25 - 29

[Abstract] [PDF Full-Text (300 KB)] **IEE CNF**

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A framework for analyzing configurations of deployable software systems

Heimbigner, D. Hall, R.S. Wolf, A.L.
Dept. of Comput. Sci., Colorado Univ., Boulder, CO , USA;

This paper appears in: **Engineering of Complex Computer Systems, 1999. ICECCS '99. Fifth IEEE International Conference on**

Meeting Date: 10/18/1999 - 10/21/1999
Publication Date: 18-21 Oct. 1999
Location: Las Vegas, NV USA
On page(s): 32 - 42
Reference Cited: 11
Number of Pages: xii+185
Inspec Accession Number: 6423156

Abstract:
Configuring and deploying a large software system is complicated when the system is composed of components and when there are numerous possible configurations for the system. In such a scenario, it is difficult for end users to specify and install an appropriate configuration for their specific environment. Defining all valid configurations of a software system is challenging, and can be addressed through a concise **specification** that can generate all of the possible configurations. The Deployable

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Print Format

Software **Description** (DSD) part of the University of Colorado Software **Dock** project, is one such **specification** format. But using the DSD runs the risk that the set of generated configurations includes some that are invalid with respect to constraints defined independently of the DSD. The paper describes a framework to support the analysis of DSD **specifications** to help developers detect potentially invalid configurations. This analysis assumes that the system components are annotated with properties, and an analysis tool is provided that takes a specific configuration and analyzes it for conflicts with respect to some set of constraints. Using the DSD, we can enumerate and analyze configurations to verify their validity. The results can be used to modify the DSD to avoid future generation of invalid configurations

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Index Terms:

configuration management formal **specification** systems analysis DSD **specifications** Deployable Software **Description** Software **Dock** project analysis tool concise **specification** deployable software systems configuration analysis end users invalid configurations large software system **specification** format system components

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L6: Entry 3 of 17 File: USPT Apr 2, 2002

DOCUMENT-IDENTIFIER: US 6366458 B1
TITLE: Docking unit for portable electronic device and locking method of docking unit

Brief Summary Text (2):
In a portable electronic device such as for example a portable computer, because importance is attached to portability, there is a limit to the number of external devices and communications devices and the like that can be built into the portable electronic device itself. And when a portable computer is used on a table, individually connecting various cables such as a printer cable, a monitor cable and a communication cable and the like and an a.c. adaptor to the computer can be extremely complicated. For this reason, an operator sometimes uses a portable computer docking unit, also called an expansion unit or docking station, for expanding the capabilities of the portable computer.

Brief Summary Text (3):
FIG. 1 shows a docking unit 1100 of this kind and a portable computer 1006. By the portable computer 1006 being slid onto the docking unit 1100 along guides 1112, a connector 1113 of the docking unit 1100 and a connector of the portable computer 1006 are connected. At this time the portable computer 1006 slides along a support part 1111 of the docking unit 1100. A key mechanism for locking the portable computer to the docking unit is disclosed in Japanese Unexamined Patent Publication No. H.6-14909.

Brief Summary Text (5):
However, if when an operator is operating a portable computer which has been set on this kind of docking unit the portable computer is mistakenly removed from the docking unit, because the connector of the portable computer is disconnected from the connector of the docking unit, the accident of processing work in progress on the computer being suddenly interrupted occurs. It is therefore an object of the present invention to solve this problem and provide a docking unit for a portable electronic device and a locking method for this docking unit which when an operator using a portable electronic device set on the docking unit tries to remove the portable electronic device from the docking unit can ensure that the portable electronic device is removed safely after processing in the electronic device is finished.

Drawing Description Text (2):
FIG. 1 is a perspective view showing a related art portable computer docking unit;

Detailed Description Text (3):
FIG. 2 shows a docking station 1 for a portable. electronic device and a portable computer 700 as a portable electronic device to be set on the docking station 1. The portable computer 700 has a computer body 2, display means 3 and a keyboard 11. For the display means 3, for example a liquid crystal display device (LCD) can be employed. This display means 3 is attached to the computer body 2 in such a way that it can be opened and closed. Also,.although it is not shown in FIG. 2, an external device such as a mouse, which is pointing device, can be connected to the computer body 2.

Detailed Description Text (7):
Next, the docking station 1 will be described. The docking station 1 shown in FIG. 2 and FIG. 3 is a docking unit for use with the portable computer 700 and is used to overcome the problem that because the portable computer 700 is small there is a limit to the size and number of devices that can be built into it. It may also be called an expansion unit.

Detailed Description Text (16):
The solenoid 50 thus performs the role of an actuator for rendering the first engaging member 41 and the second engaging member 42 immovable and can lock and maintain a state wherein the operating means 33 holds the portable computer.

Detailed Description Text (21):
Next, removal from the locked state in this portable electronic device docking unit will be explained. As shown in FIGS. 7A through 7D, the computer body 2 can be kept held (locked) to the docking station 1, but when the portable computer 700 is to be undocked, in the following kinds of case, the lock is prevented from being released until processing for this undocking is finished and only when processing for this undocking is finished is the computer body 2 allowed to be removed from the docking station 1. The reason for this is that if this is not done then processing in the computer 700 is interrupted. Case (1): By the operator giving an instruction of finishing of processing for undocking of the computer 700 in the computer 700, on the basis of a command from the portable computer 700, the computer body 2 is removed from the docking station 1 without the operation of the computer 700 being affected and the connectors 35, 36 of FIG. 2 are thereby disconnected. Case (2): When during operation of the computer 700 the operator has accidentally touched the operating lever 40 of the operating means 33 of FIG. 2, shut down processing is displayed on the screen of the display means on the computer 700 side and processing to shut down the operation of the computer 700 is carried out and then the computer body 2 is removed from the docking station 1 without the operation of the computer 700 being affected and the connectors 35, 36 of FIG. 2 are thereby disconnected.

Detailed Description Text (26):
The invention is not limited to the preferred embodiment described above. For example, although in the preferred embodiment described above a so-called portable computer was used as an example of a portable electronic device, the invention is not limited to this and includes docking units for other types of device, for example information terminals and video/audio devices. And although the first engaging member 41 and the second engaging member 42 shown in FIG. 5 and FIG. 6 are mechanically connected by a connecting member 43, the invention is not limited to this and alternatively the first engaging member 41 and the second engaging member 42 may each be provided with a operating lever 40 of the kind shown in FIG. 5 and have their engagement released individually. And the holding of the engaged state of the first engaging member 41 and the second engaging member 42 does not have to be effected using a solenoid 50 as the actuator and other types of actuator can of course be employed. And although the base part 31 of the docking station 1 is inclined at an angle .theta. to the bottom face 31a as shown in FIG. 2 the base part 31 may alternatively be horizontal.

Current US Original Classification (1):
361/686

Current US Cross Reference Classification (1):
710/303

CLAIMS:

2. The docking unit according to claim 1, wherein said portable electronic device is a portable computer.

19. The docking unit according to claim 18, wherein said portable electronic device is a portable computer.

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L6: Entry 3 of 17 File: USPT Apr 2, 2002

US-PAT-NO: 6366458
DOCUMENT-IDENTIFIER: US 6366458 B1

TITLE: Docking unit for portable electronic device and locking method of docking unit

DATE-ISSUED: April 2, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Yoshida; Tatsuo	Kanagawa			JP
Karasawa; Akio	Nagano			JP

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Sony Corporation				JP	03

APPL-NO: 09/ 104282 [PALM]
DATE FILED: June 25, 1998

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	P09-174175	June 30, 1997
JP	P09-174176	June 30, 1997

INT-CL: [07] G06 F 1/16, H05 K 7/02

US-CL-ISSUED: 361/686; 710/102
US-CL-CURRENT: 361/686; 710/303

FIELD-OF-SEARCH: 361/686, 361/724, 361/725, 361/727, 710/102

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	5313596	May 1994	Swindler et al.	395/326
☐	5323291	June 1994	Boyle et al.	361/686
☐	5450271	September 1995	Fukushima et al.	

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☐	5477415	December 1995	Mitcham et al.	361/686
☐	5530620	June 1996	Sangveraphunsiri	361/686
☐	5557562	September 1996	Yoshiharu et al.	361/686
☐	5640301	June 1997	Roecker et al.	361/686
☐	5664118	September 1997	Nishgaki et al.	395/283
☐	5737541	April 1998	Shimizu et al.	361/686
☐	5751547	May 1998	Honda et al.	361/686
☐	5822185	October 1998	Cavello	361/686
☐	5864294	January 1999	Hsu et al.	361/686
☐	5933321	August 1999	Ruch et al.	361/686

ART-UNIT: 2835

PRIMARY-EXAMINER: Feild; Lynn D.

ATTY-AGENT-FIRM: Rader, Fishman & Grauer PLLC Kananen; Ronald P.

ABSTRACT:

A docking unit for a portable electronic device with which it is possible to establish electrical connection of a portable electronic device surely and easily. A docking unit for electrically connecting a portable electronic device to external devices by having the portable electronic device set engage/disengageably thereon using a connector has a base part for supporting the portable electronic device, positioning means for positioning the portable electronic device in a predetermined position on the base part as the portable electronic device is moved over the base part, and operating means, having and engaging part for engaging with the portable electronic device means, for holding the positioned portable electronic device using the engaging part.1

30 Claims, 14 Drawing figures

Previous Doc Next Doc Go to Doc#

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L6: Entry 11 of 17 File: USPT Feb 2, 1999

DOCUMENT-IDENTIFIER: US 5867406 A
TITLE: Docking device for a portable computer and a method for docking a portable computer to the docking device

Abstract Text (1):
A docking device for a portable computer includes a body adapted to receive a portable computer. The body encloses a number of electronic components adapted to be connected to a portable computer via a number of signal lines. A connector is provided in the body which mechanically connects the number of signal lines within the body to a corresponding number of signal lines within the portable computer. The docking device also includes a signal connection means interposed between the portable computer and the electronic components for selectively electrically interconnecting the particular ones of the signal lines within the body to corresponding signal lines among the number of signal lines within the portable computer in response to an operating state of said portable computer. A preferred embodiment of the docking device further includes a control means for controlling the selective electrical interconnection of the particular ones of the number of signal lines by the signal connection means. In this preferred embodiment, the control means electrically interconnects the particular ones of the number of signal lines within the body to corresponding signal lines within the portable computer in response to an acknowledgment by the portable computer of a request by the control means to electrically interconnect the particular ones of the number of signal lines.

Brief Summary Text (3):
The present invention relates in general to an improved method and system for data processing and in particular to a docking device to which a portable computer can be docked and a method for controlling the docking device. Still more particularly, the present invention relates to an improved docking device for a portable computer and a method for controlling the docking device which enables the docking and undocking of the portable computer and the docking device when the portable computer is operating at either an ordinary or a reduced power level.

Brief Summary Text (5):
A. Portable Computer

Brief Summary Text (6):
With recent technological innovations, small and lightweight portable personal computers (or portable computers) have become widely available. With reference now to FIG. 17, there is illustrated an example of a conventional portable computer. As illustrated, a portable computer 1000 comprises a thin main body 1010, and a cover 1020 which is connected so as to be freely opened and closed with respect to the main body 1010. The cover 1020 has a pair of projections 1021 formed in the lower end thereof, whereby the cover 1020 is hinged-connected to the main body 1010. Within cover 1020, a liquid crystal display (LCD) 1022 is disposed as the display means of portable computer 1000. Further, on the top of the main body 1010, a keyboard 1011 is disposed as the input means of portable computer 1000.

Brief Summary Text (8):
B. Docking Device for a Portable Computer

Brief Summary Text (9):
For portable computers such as portable computer 1000, retaining portability limits the external storage and communication units which can be built in the computer. Further, when a portable computer is used on a desk top, it is very cumbersome to separately connect various cables such as the printer cable, monitor cable, and communication cable and an AC adapter. In addition, because the size of the portable computer is small, the size and number of devices which can be accommodated are limited. Thus, a docking device for a portable computer, also called an "expansion unit" or a "docking station," which support additional capabilities of the portable computer (hereinafter, simply referred to as a "docking device", whereas a portable computer to be connected and used is also simply referred to as a "host") has already been developed and is publicly available.

Brief Summary Text (10):
With reference to FIG. 19, there is illustrated a conventional docking device for a portable computer. Docking device 1100 comprises base body 1110 and a cover 1120. The base body 1110 has a support section 1111 on which the portable computer 1000 is mounted. On both sides of the support section 1111, guides 1112 are provided into which the portable computer is inserted. In the back of the support section 1110, a connector 1113 for connection of signals between the portable computer 1000 and docking device 1100 is provided. Referring now to FIG. 20, there is depicted an isometric view of the back of portable computer 1000. In the back of the main system body 1010, connector 1113 is provided for connection of signals between portable computer 1000 and the docking device 1100. As depicted in FIG. 21, portable computer 1000 slides across support section 1111 along the guides 1112 until portable computer 1000 and 1100 are docked by connection of connectors 1017 and 1113. Undocking is performed by following the foregoing procedure in reverse.

Brief Summary Text (11):
In addition to this application, for instance, in the Patent Application 3-273323, Patent Application No.3-294917, Patent Application No. 4-617, Patent Application No. 4-186411, Utility Model Application No. 3-119220, and Utility Model Application No. 3-127933, there are also described docking devices for a portable computer.

Brief Summary Text (12):
A docking device for a portable computer generally performs two major functions--port replication and bus expansion. The port replication function is achieved by providing an extension of the port signals of the portable computer in the docking device. That is, if the above-described various cables are previously connected to the individual ports of the docking device, the user can use a printer, monitor, etc., simply by docking the portable computer with the docking device, thereby eliminating the cumbersome work of separately connecting a cable for each device. In addition, the number of ports which are available on the docking device is usually larger than the number provide on the portable computer, consequently enabling more devices to be connected to the portable computer.

Brief Summary Text (13):
The bus expansion function is achieved by the docking device having an extension of the system bus of the portable computer. Since the portable computer is compact, the number of devices which can be directly connected to the system bus (for example, an ISA bus) is relatively small. Accordingly, by connecting desired devices to the system bus extension within the docking device, the portable computer can use additional devices. The devices can include, for example, an add-on HDD (for example, an IDE.sub.-- HDD), SCSI device, and a PCMCIA device. The SCSI device and PCMCIA device are devices which conform to the Small Computer System Interface (SCSI) standard and Personal Computer Memory Card Interface Association (PCMCIA) standard, respectively, (in brief, it is to be understood that IDE, PCMCIA, and SCSI are standards for connection of devices to an ISA bus), which are

usually connected to the system bus through a SCSI controller and a PCMCIA controller. Accordingly, if the SCSI controller and the PCMCIA controller are provided on the system bus extension within the docking device, devices are easily added on. Thus, the main role of the docking device for a portable computer would be to supplement the functions of the portable computer which are insufficient because of its compact structure.

Brief Summary Text (14):
C. Docking of a Portable Computer With the Docking Device

Brief Summary Text (15):
The connection of a docking device for a portable computer with a portable computer is usually performed by a single connector which includes all of the port signals, bus signals, control signals and the like, rather than by discrete connectors provided for the respective cables and devices. The reason for this is that it would be difficult, if not impossible, to manufacture a docking device which enabled mechanical alignment between a plurality of connectors and mechanical alignment between each pin of each connector. For example, in the above described Patent Application No. 4-291028, the docking station and the portable computer are docked utilizing a single connector formed by bundling all of the signals, as shown in FIGS. 19 and 20. Similarly, Patent Application No. 3-273323, Patent Application No. 3-294917, Patent Application No. 4-617, Patent Application No. 4-186411, Utility Model Application No. 3-119220, and Utility Model Application No. 3-127933, in accordance with the drawings attached to each specification, describe a docking device and a portable computer which are docked by a single connector.

Brief Summary Text (16):
If a docking device and a portable computer are mechanically connected by a single connector containing all of the required signals, as described above, several technical problems remain. One of the problems is to electrically connect both systems smoothly when the portable computer is in a power-on state or a power save mode such as suspend, in other words, an active state in which the power supply to the portable computer is not completely shut off.

Brief Summary Text (17):
Those skilled in the art will appreciate from the above description that the connector for connecting the portable computer and docking device includes signals having various characteristics. These signals can be classified into two categories. One category comprises port signals for connection to a keyboard, mouse and CRT, and the other category includes bus signals such as the system bus, PCMCIA control signal, IDE.sub.-- HDD control signal, and FDD signal. One criterion for such classification is that the port signals can be connected or disconnected even in a power-on state (namely an active state), whereas the bus signals cannot be connected or disconnected when active. The reason for this distinction is described below.

Brief Summary Text (19):
Accordingly, in conventional systems, the docking of a portable computer and docking device is permitted only when the portable computer is powered off and the system is not installed. Even when operating in a power management mode which extends the operating time of the self-contained battery, the portable computer could not be docked with the docking device since the power is not completely shut off. In addition, in case a user attempted docking despite the portable computer being powered-on, many conventional systems include a fail safe for which the operations are described below and illustrated in Table 1.

Brief Summary Text (20):
(1) If the docking of the portable computer with the docking device is attempted in an ordinary operation state or standby state (in other words, a power-on state), the power supply of the portable computer is forcibly shut down to prevent damage

to the docking device hardware.

Brief Summary Text (21):
(2) If docking is attempted in a suspend state, the docking device inhibits operation of the portable computer from being resumed after docking. In addition, the docking device issues a warning (usually a beep) to warn that such docking is not allowed (an operation error).

Brief Summary Text (23):
In summary, the portable computer and the docking device could not be smoothly docked when the portable computer was in a power-on state.

Brief Summary Text (24):
Incidentally, standby and suspend are part of the power management (PM) operations which have recently become available on portable computers. The standby mode is a mode in which the power is shut down only for particular devices such as a liquid crystal display (LCD), while the system bus remains active. The suspend mode is a mode in which the system bus is inactive and the power for components other than the main memory is shut down after the data necessary for resuming a task is saved in the main memory. To return from the suspend mode to the ordinary operation state is called resume. Such power management operations are performed, for instance, by a program called PM code (loaded into the memory when the system is initiated).

Brief Summary Text (25):
However, among the devices connected through the signal port having the capability of active connection or disconnection, there are some which the user desires to promptly use while the portable computer is in an operating state. For instance, a document of a program being edited on the portable computer may be printed at once by the printer connected to the docking device. Also, a coordinate input using the mouse connected to the docking device may be desired. Even in the event that an operation which the user desires to be immediately performed occurs, if the user must perform a lengthy procedure that requires temporarily turning off the power of the portable computer before making connection, the user may perceive that the docking device is difficult to use.

Brief Summary Text (28):
It is another object of the present invention to provide an improved docking device for a portable computer and a method for controlling the docking device.

Brief Summary Text (29):
It is yet another object of the present invention to provide an improved docking device for a portable computer and a control method thereof which enables the docking and undocking of the portable computer and the docking device when the portable computer is operating at an ordinary or reduced power level.

Brief Summary Text (30):
The foregoing objects are achieved as is now described. A docking device for a portable computer is disclosed which includes a body adapted to receive a portable computer that encloses a number of electronic components adapted to be connected to a portable computer via a number of signal lines. A connector is provided in the body which mechanically connects the number of signal lines within the body to a corresponding number of signal lines within the portable computer. The docking device also includes a signal connection means interposed between the portable computer and the electronic components for selectively electrically interconnecting the particular ones of the signal lines within the body to corresponding signal lines among the number of signal lines within the portable computer in response to an operating state of said portable computer. A preferred embodiment of the docking device further includes a control means for controlling the selective electrical interconnection of the particular ones of the number of signal lines by the signal connection means. In this preferred embodiment, the control means electrically

interconnects the particular ones of the number of signal lines within the body to corresponding signal lines within the portable computer in response to an acknowledgment by the portable computer of a request by the control means to electrically interconnect the particular ones of the number of signal lines.

Drawing Description Text (3):
FIG. 1 illustrates a preferred embodiment of the hardware configuration of a portable computer and the docking device for a portable computer of the present invention and, more particularly, illustrates a hardware configuration featuring bus signals and port signals;

Drawing Description Text (4):
FIG. 2 depicts the software configuration of the portable computer illustrated in FIG. 1;

Drawing Description Text (5):
FIG. 3 illustrates a preferred embodiment of the power supply system of the portable computer and the docking device for a portable computer of the present invention;

Drawing Description Text (6):
FIG. 4 schematically depicts the pin assignment of the connector for coupling the portable computer and the docking device illustrated in FIG. 1;

Drawing Description Text (7):
FIG. 5 illustrates the construction of the DOCKED# signal included in the connector for coupling the portable computer and the docking device represents the docking state;

Drawing Description Text (8):
FIGS. 6A and 6B depict the construction of the NOTE.sub.-- ID0 signal which indicates whether the portable computer is conventional;

Drawing Description Text (9):
FIG. 7 is a flowchart illustrating the process of docking the portable computer (host) with the docking device;

Drawing Description Text (10):
FIG. 8 is a flowchart depicting the process of docking the portable computer (host) with the docking device and, more particularly, the process of docking when the portable computer is in an ordinary operating state;

Drawing Description Text (11):
FIG. 9 is a flowchart illustrating the process docking the portable computer while the portable computer is in a suspend state;

Drawing Description Text (12):
FIG. 10 is a flowchart depicting the process of docking the portable computer while the portable computer is in a power-off state;

Drawing Description Text (13):
FIG. 11 is a flowchart illustrating the process of undocking the portable computer from the docking device;

Drawing Description Text (14):
FIG. 12 is a flowchart depicting the process of undocking the portable computer while the portable computer is in an ordinary operating state;

Drawing Description Text (15):
FIG. 13 is a flowchart illustrating the process of undocking the portable computer

while the portable computer is in a suspend state;

Drawing Description Text (16):
FIG. 14 is a flowchart depicting the process of undocking the portable computer while the portable computer is in a power-off state;

Drawing Description Text (17):
FIG. 15 is a flowchart illustrating the process of docking a conventional portable computer from the docking device of the present invention;

Drawing Description Text (18):
FIG. 16 is a flowchart depicting the process of undocking a conventional portable computer from the docking device of the present invention;

Drawing Description Text (19):
FIG. 17 is a perspective view illustrating the appearance of a conventional portable computer;

Drawing Description Text (20):
FIG. 18 depicts a perspective view of a conventional portable computer and, more particularly, depicts a state in which the inside of the main body is exposed by opening the keyboard;

Drawing Description Text (21):
FIG. 19 illustrates a conventional docking device for a conventional portable computer;

Drawing Description Text (22):
FIG. 20 depicts a perspective view of the back of a conventional portable computer;

Drawing Description Text (23):
FIG. 21 illustrates docking or undocking the conventional portable computer from the conventional docking device; and

Drawing Description Text (24):
FIG. 22 schematically depicts the construction of each device controller interposed between the system bus and the port signals within a conventional portable computer.

Detailed Description Text (3):
With reference now to the figures, and in particular with reference to FIG. 1, there is illustrated a block diagram of a preferred embodiment of the hardware configuration of a docking device for a portable computer and a portable computer according to the present invention. However, those skilled in the art will appreciate that details not required for an understanding of the present invention have been omitted for simplicity. In FIG. 1, the section depicted to the left of a dashed line X--X' shows the hardware configuration of the portable computer (host) 50.

Detailed Description Text (4):
CPU 1 controls the operation of portable computer 50. In the depicted embodiment, CPU 1 contains a memory controller and communicates with main memory 3 through memory bus 2. The main memory 3 is typically a writable memory such as DRAM. Basic Input/Output System (BIOS) and an operating system (OS) are loaded from ROM (not shown) or external storage (described later) into the main memory 3, when the system is initialized. Various applications are loaded to main memory 3 on user demand. In addition, main memory 3 is adapted to temporarily store working data when the CPU 1 executes a task. FIG. 2 illustrates a software configuration 70 of portable computer 50. Various applications 71 are executed under the support of an

OS/utility 72. The hardware operation for various devices (including the docking device) 74 is not directly carried out by the applications 71 or OS 72, but supported by BIOS 73.

Detailed Description Text (5):
Returning to FIG. 1, CPU 1 also connects for communication with a keyboard/mouse controller 5, a video controller 6, an audio controller 7 and a serial/parallel I/O controller 8 through a system bus 4. Although system bus 4 is an ISA bus in this preferred embodiment, those skilled in the art will appreciate that a microchannel (MC) bus or PCI bus may also be utilized. Keyboard/mouse controller 5 receives input signals from a mouse and a keyboard. The mouse or keyboard may be those which are externally connected through a keyboard/mouse port 17, or may be a keyboard 9 built into the portable computer 50. The video controller 6 provides control for displaying image data according to the content of a VRAM 10. Although the portable computer 50 includes a liquid crystal display (LCD) 12 connected via a screen buffer 11, an additional CRT display (not shown) may optionally be connected via a CRT (analog video signal) port 18. The audio controller 7 processes the input/output of an audio signal. The audio signal is output by a built-in speaker 14 via an amplifier circuit 13, or input or output to an external audio device (not shown) via an audio input/output port 30. The serial/parallel I/O controller 8 controls timing and the like during data transfer between various I/O devices connected via a serial port 15 or a parallel port 16. Generally, a device transferring data on a bit-by-bit basis, such as a modem, is attached to the serial port 15 and a device transferring data on a byte-by-byte basis, such as a dot matrix printer, is attached to the parallel port 16.

Detailed Description Text (6):
Various ports such as the above-described serial port 15, parallel port 16, keyboard/mouse port 17, and analog video port 18 are typically separately disposed on the back of the portable computer 50 as is illustrated with respect to portable computer 1000 in FIG. 20. When docked with docking device 60 in FIG. 1, these ports are closed by contact with the back of the support section of the docking device 60 to prevent a cable from being connected to the ports. The various port signals branch en route to their respective ports and are assigned to the pins of a connector Y--Y' for connection with the docking device, as described later.

Detailed Description Text (7):
Hard disk drive (HDD) and a floppy disk drive (FDD) are mounted on the portable computer 50 as external storage. In this embodiment, as the HDD, an IDE.sub.-- HDD 19 is used which can be connected using some signals of the ISA bus. A FDD 21 is controlled by a floppy disk controller (FDC) 20 which directly communicates with the system bus 4. Slots 22 are provided in the portable computer 50 for storing PCMCIA cards. PCMCIA controller 23 is provided for data exchange between the mounted cards and the system bus 4.

Detailed Description Text (8):
Finally, portable computer 50 includes an interrupt handler 24. The interrupt handler 24 continuously monitors the system bus 4 (more particularly, EVENT# of the bus signals) and detects the occurrence of a software interrupt also referred to as SMI (System Management Interrupt). In the depicted embodiment of the present invention, EVENT# in state ACTIVE LOW corresponds to a software interrupt in any device (including docking device 60) which notifies BIOS 73 of the interrupt, as described later.

Detailed Description Text (10):
The port signals outgoing from the serial parallel I/O controller 8, keyboard/mouse controller 5, video controller 6 and audio controller 7 from portable computer 50 branch to a serial port 25, parallel port 26, keyboard port 27, mouse port 28, CRT port 29, and audio input/output port 30 within the docking device side. That is, it is understood that the ports 25-30 within docking device 60 function as ports 15-18

within portable computer 50 or expand the number of such ports. The user may connect various devices such as a modem and a printer to ports 25-30 before docking host 50, as additional devices are required.

Detailed Description Text (11):
System bus 4 within host 50 branches to a main bus 33 and a subbus 34 within docking device 60 just after the connector Y--Y'. Main bus 33 comprises the signals which cannot be connected or disconnected while active, such as the IDE HDD control signal, PCMCIA control signal, FDD signal, and LCD panel control signal, in addition to signals within system bus 4. SCSI controller 35, a PCMCIA controller 36, an IDE.sub.-- HDD (externally connected HDD) 37, and ISA expansion slots 40 are connected to main bus 33 via a main bus isolator 31. The SCSI controller 35 is a controller for allowing data exchange between an SCSI device and the system bus, and, on its local side, there are disposed a number of SCSI connectors (including both built-in and expansion types) 38 for connecting SCSI devices. PCMCIA controller 36 is a controller which allows data to be exchanged between a PCMCIA device and system bus 4. On the local side of PCMCIA controller 36, there are disposed slots 39 for connecting PCMCIA cards. Those skilled in the art will recognize that by connecting various devices and cards to connectors 38 and slots 39, the peripheral environment of portable computer 50 can be expanded.

Detailed Description Text (13):
Subbus 34 comprises some bus signals of system bus 4, such as I/O.sub.-- Read# and I/O.sub.-- Write#, and a docking control signal which will be described later. Subbus 34 communicates with interface circuit 41 and CPU 42 via a subbus isolator 32. The above-mentioned signals included in subbus 34 are signals which cannot conflict with the resources host 50. Interface circuit 41 outputs data only when an I/O access is performed and remains in a receive state except for such I/O accesses, so that interface circuit 41 does not disturb the signal waveform of system bus 4. Accordingly, the subbus 34 can be coupled or decoupled when portable computer 50 is active, unlike the main bus 33. The subbus isolator 32 electrically isolates system bus 4 and subbus 34 even after the connector Y--Y' is mechanically coupled. For instance, if host 50 in a power-off state and subbus 34 in a power-on state are mechanically connected, hardware damage within host 50 is prevented because subbus isolator 32 electrically isolates the two from each other. The docking/undocking operation by the subbus isolator 32 is performed via interface circuit 41 by CPU 42, which will be described below.

Detailed Description Text (17):
B. Power Supply Mechanism of the Portable Computer and the Docking Device

Detailed Description Text (18):
With reference now to FIG. 3, there is illustrated the hardware configuration of the power systems of host 50 and docking device 60. Power to system load 87 of portable computer 50 is supplied from a commercial power supply via an AC/DC adapter (not shown) and an AC/DC converter 81 when it is in a stand-alone state or from a built-in rechargeable battery 82 (for instance, a Ni-MH or Ni-Cd battery). In addition, power is supplied from docking device 60 when docked with the docking device 60, as is explained below.

Detailed Description Text (19):
Power for the docking device 60 is supplied only from a commercial power supply. A power supply adapter 80 connected to the commercial power supply through an outlet has an AC/DC converter 83, a CVCPCC (constant voltage, constant power, constant current) generator 84, a sub-DC power supply 85, and a main DC power supply 86. The AC/DC converter 83 is used to convert the commercial power supply to a direct current. The CVCPCC generator 84 is a circuit for generating power with a volt-ampere characteristic of constant voltage, constant power, and constant current and sending the power to the host 50. The characteristic of CVCPCC generator 84 is only for correspondence to the characteristic of battery 82 contained in portable

computer 50 and is not restrictive. For instance, generator 84 may be CVCC.

Detailed Description Text (23):
Portable computer 50 and docking device 60 are docked by a single connector in which all of the signals are bundled, as has already been described. Referring now to FIG. 4, there is depicted a preferred embodiment of the pin assignment of this connector. The number of pins within connector 90 is 240 in a preferred embodiment. The width of each segment of connector 90 generally represents the number of pins assigned to that segment.

Detailed Description Text (24):
As shown in FIG. 4, connector 90 includes the bus (system bus) signals 150, PCMCIA control signals 152, IDE.sub.-- HDD control signals 154, FDD signals 156, port signals 158, docking control signals 160, LCD panel control signals 162, as well as other signals. System bus 33 is, in a preferred embodiment, one which utilizes the ISA standard. PCMCIA control signals 152 and IDE.sub.-- HDD control signals 154 are signals which support functions other than those within the ISA standard. Port signals 158 include the serial port signal, parallel port signal, keyboard port signal, and similar signals as is also illustrated in FIG. 1. Docking control signals 160 comprise the signals for controlling the docking/undocking of docking device 60 with portable computer 50. In addition, LCD panel control signals 162 are digital video signals for driving LCD 12 from docking device 60. Signals 162 are some of the signals which cannot be connected or disconnected while active, and are thus included in main bus 33 (not illustrated in FIG. 1).

Detailed Description Text (26):
DOCKED# is a signal that indicates whether portable computer 50 is docked with docking device 60. As shown in FIG. 5, since DOCKED# is pulled down within host 50 and pulled up within docking device 60, DOCKED# within docking device 60 indicates ACTIVE.sub.-- LOW when host 50 and docking device 60 are docked.

Detailed Description Text (27):
NOTE.sub.-- ID0 is a signal which indicates whether host 50 is a new type of portable computer or an old type. Here, the new type means a portable computer able to communicate with docking device 60 and the old type means a conventional portable computer which does not have such a capability. The communication which host 50 performs with docking device 60 specifically means that host 50 processes the SMI issued by the interface circuit 41 and responds to docking device 60 (see sections D and E, below). If host 50 is of the new type, docking device 60 performs the operations described below in sections D and E, and, if of the old type, the operation described in sections F and G. With reference to FIGS. 6A and 6B, the specific construction of NOTE.sub.-- ID0 is depicted. As illustrated in FIG. 6A, NOTE.sub.-- ID0 within portable computer 50 of the old type does not have a connection relationship, and thus NOTE.sub.-- ID0 within docking device 60 cannot obtain an output. On the other hand, as shown in FIG. 6B, NOTE.sub.-- ID0 within portable computer 50 of the new type is pulled down, and thus NOTE.sub.-- ID0 within docking device 60 can obtain ACTIVE.sub.-- LOW as an output.

Detailed Description Text (29):
D. Docking a Portable Computer With the Docking Device

Detailed Description Text (31):
With reference now to FIG. 7, the process begins at block 100 when the connectors for connecting host 50 and docking device 60 are mechanically coupled by the user. Since the interface circuit 41 and the CPU 42 communicating with the subbus 34 within docking device 60 are already in an operating state, the mechanical connection can be detected by a change in DOCKED# to ACTIVE.sub.-- LOW as illustrated at step 102. Then, at block 104 it is determined from NOTE.sub.-- ID0 whether host 50 is a new type or an old type of portable computer. If host 50 is an old type, the SMI from the docking device 60 cannot be processed as described

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above, and thus system bus 4 cannot be electrically connected in the same operation. Accordingly, the process branches to off-page connector S.

Detailed Description Text (44):
E. Undocking a Portable Computer From the Docking Device

Detailed Description Text (45):
With reference now to FIG. 11, the process begins at block 500 and proceeds to block 502, where a request for undocking is generated by the user pressing eject button 44 on the docking device 60 or by software executing within host 50. In the former case, CPU 42 is activated by the eject button 44 and, in the latter case, CPU 42 detects request for undocking by DOCKED#. Then, at block 504, it is determined by NOTE.sub.-- ID0 whether host 50 is a new type or an old type of portable computer. If host 50 is the old type, host 50 cannot process the SMI issued by docking device 60; thus, the process proceeds from block 504 to off-page connector W.

Detailed Description Text (50):
F. Docking a Conventional Portable Computer

Detailed Description Text (51):
If host 50 is a conventional portable computer, host 50 cannot handle the SMI from docking device 60, as has been described in section C. Consequently, those skilled in the art will appreciate that operations similar to sections D and E cannot be performed by a conventional portable computer. Thus, in a preferred embodiment of the present invention, if host 50 determined to be a conventional portable computer at block 104 of FIG. 7, the docking process continues following on-page connector S in FIG. 15. At block 900, docking devices 60 determines the power supply state of host 50 from the states of PWR.sub.-- ON# and SUS.sub.-- STAT#. If docking is attempted when the host 50 is in an ordinary operating state, at block 902 the docking device 60 beeps to warn the user that docking is prohibited. More specifically, CPU 42 detects the attempted docking from NOTE.sub.-- ID0 of DOCKED# being high and activates an alarm (not shown). However, since main bus 33 is electrically isolated by main bus isolator 31, the hardware coupled to main bus 33 cannot be electrically damaged by a sudden docking. Accordingly, the power of host 50 need not be forcibly shut down as is done by some prior art system, enabling the user can avoid the suspension of a current task by such an inadvertent docking.

Detailed Description Text (53):
G. Undocking a Conventional Portable Computer

Detailed Description Text (54):
If host 50 is a conventional portable computer, host 50 is not equipped to handle the SMI generated by docking device 60. Thus, if host 50 is determined to be a conventional portable computer at block 504 be of FIG. 11, undocking is performed as illustrated in FIG. 16. The process begins at on-page connector W and then proceeds to block 910, which depicts determining the power supply state of host 50. If undocking of host 50 and docking device 60 is attempted when host 50 is in an ordinary operating state, docking device 60 beeps to warn the user that undocking is prohibited at block 912. In addition to the warning, docking device 60 may lock the undocking of host 50 by hardware. If the undocking of host 50 and docking device 60 is attempted when host 50 is in a suspend state, docking device 60 inhibits host 50 from being resumed and beeps to warn that the undocking is unauthorized at block 904. The undocking of systems 50 and 60 when host 50 is in a power-off state is an operation which is permitted even in the prior art. Accordingly, the user can freely undock host 50 and docking device 60 at block 916. If the power of host 50 is turned on again, POR is executed in the usual manner.

Detailed Description Text (55):
As described above, the present invention provides a user-friendly docking device

for a portable computer and a method for controlling the docking device. The preset invention permits a portable computer in an ordinary power-on state or a power save mode such as suspend (in other words, an active state in which the power supply to the portable computer is not completely shut down) to be docked with the docking device without a user-perceived delay in operation.

Current US Cross Reference Classification (1):
361/683

Current US Cross Reference Classification (2):
361/729

CLAIMS:

1. A docking device for a portable computer, said docking device comprising:

a body having one or more electronic components that are electrically connectable to said portable computer via a first plurality of signal lines;

a connector within said body, wherein said connector is mechanically connectable to a second plurality of signal lines within said portable computer; and

a signal connection circuit interposed between said portable computer and said one or more electronic components, wherein said signal connection circuit selectively electrically interconnects particular ones of said first plurality of signal lines to corresponding signal lines among said second plurality of signal lines while said portable computer is in an ordinary operating state in which said second plurality of signal lines are active.

2. The docking device for a portable computer of claim 1, and further comprising:

an interface circuit that controls said selective electrical interconnection of said particular ones of said plurality of signal lines by said signal connection circuit.

3. The docking device for a portable computer of claim 2, wherein said interface circuit causes said signal connection circuit to electrically interconnect said particular ones of said first plurality of signal lines within said body to corresponding signal lines among said second plurality of signal lines within said portable computer in response to an acknowledgment by said portable computer of a request to electrically connect said particular ones of said first plurality of signal lines.

4. The docking device for a portable computer of claim 3, wherein said request to electrically connect said particular ones of said first plurality of control lines comprises a software interrupt.

5. The docking device for a portable computer of claim 2, wherein said particular ones of said first plurality of signal lines includes signal lines that transmit bus signals, and wherein said interface circuit causes said signal connection circuit to selectively electrically interconnect said particular ones of said first plurality of signal lines to corresponding signal lines among said second plurality of signal lines within said portable computer when bus traffic is relatively low.

6. The docking device for a portable computer of claim 2, wherein said signal connection circuit comprises a first bus isolator electrically coupled between said connector and said first plurality of signal lines.

7. The docking device for a portable computer of claim 6, said signal connection circuit comprising a second bus isolator electrically coupled between said

interface circuit and said connector, wherein said second bus isolator selectively electrically connects said interface circuit and said connector.

8. The docking device for a portable computer of claim 2, wherein:

said docking device further comprises a processor coupled to said interface circuit; and

said interface circuit includes at least one register utilized by said processor for communication with said portable computer.

9. The docking device for a portable computer of claim 1, and further comprising:

a circuit that detects mechanical interconnection of said second plurality of signal lines and said connector.

10. The docking device of claim 1, wherein said signal connection circuit selectively electrically disconnects particular ones of said first plurality of signal lines from corresponding signal lines among said second plurality of signal lines while said portable computer is in said ordinary operating state in which said second plurality of signal lines are active.

11. A method for docking a portable computer to a docking device, said docking device having one or more electronic components that are electrically connectable to said portable computer via a first plurality of signal lines, and a connector within said body that is mechanically connectable to a second plurality of signal lines within said portable computer, said method comprising:

detecting mechanical connection of said connector provided in said body and said second plurality of signal lines within said portable computer;

in response to a detection of mechanical connection between said connector and said second plurality of signal lines, transmitting to said portable computer a request to electrically connect particular ones of said first plurality of signal lines within said body to corresponding signal lines among said second plurality of signal lines within said portable computer; and

in response to receipt of an acknowledgement from said portable computer of said request to electrically connect said particular ones of said first plurality of signal lines, electrically interconnecting said particular ones of said first plurality of signal lines within said body to corresponding signal lines among said second plurality of signal lines within said portable computer, such that electrical connection between said plurality of electronic components and said portable computer is achieved while said portable computer is in an ordinary operating state in which said second plurality of signal lines are active.

12. The method for docking a portable computer to a docking device of claim 11, wherein said step of transmitting a request to electrically connect said particular ones of said first plurality of signal lines comprises transmitting a software interrupt.

13. The method for docking a portable computer to a docking device of claim 11, wherein said portable computer includes a plurality of electronic components, and wherein said portable computer acknowledges said request to electrically connect said particular ones of said first plurality of signal lines only if said one or more electronic components within said docking device do not conflict with said plurality of electronic components within said portable computer.

14. The method for docking a portable computer to a docking device of claim 13, wherein said step of electrically interconnecting said particular ones of said

first plurality of signal lines comprises:

monitoring signal activity in signal lines among said second plurality of signal lines within said portable computer which correspond to said particular ones of said first plurality of signal lines within said body; and

electrically interconnecting said particular ones of said first plurality of signal lines within said body to corresponding signal lines among said second plurality of signal lines within said portable computer at a time of relatively low signal activity.

15. The method for docking a portable computer to a docking device of claim 11, said docking device further including a bus isolator coupled to said connector and a processor coupled to said bus isolator, said method further comprising the step of:

establishing electrical connection between said processor and said connector via said bus isolator in response to a detection of mechanical connection between said connector and said second plurality of signal lines.

16. A method of undocking a portable computer from a docking device to which said portable computer is mechanically and electrically connected, said docking device having a body adapted to receive said portable computer, said body having one or more electronic components electrically connected to said portable computer via a first plurality of signal lines, and a connector within said body that is mechanically connected to a second plurality of signal lines within said portable computer, said method comprising:

in response to a receipt of a selected input, transmitting a request to undock from one of said docking device and said portable computer to the other of said docking device and said portable computer; and

in response to acknowledgement of said request by the other of said docking device and said portable computer, electrically disconnecting said first plurality of signal lines within said body from said second plurality of signal lines within said portable computer prior to mechanical disconnection of said second plurality of signal lines and said connector, wherein said portable computer can be undocked while in an ordinary operating state in which said second plurality of signal lines are active.

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PRIOR-ART-DISCLOSED:

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Search Selected Search ALL Clear

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ABSTRACT:

A docking device for a portable computer includes a body adapted to receive a portable computer. The body encloses a number of electronic components adapted to be connected to a portable computer via a number of signal lines. A connector is provided in the body which mechanically connects the number of signal lines within the body to a corresponding number of signal lines within the portable computer. The docking device also includes a signal connection means interposed between the portable computer and the electronic components for selectively electrically interconnecting the particular ones of the signal lines within the body to corresponding signal lines among the number of signal lines within the portable computer in response to an operating state of said portable computer. A preferred embodiment of the docking device further includes a control means for controlling the selective electrical interconnection of the particular ones of the number of signal lines by the signal connection means. In this preferred embodiment, the control means electrically interconnects the particular ones of the number of signal lines within the body to corresponding signal lines within the portable computer in response to an acknowledgment by the portable computer of a request by the control means to electrically interconnect the particular ones of the number of signal lines.

17 Claims, 23 Drawing figures

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(12) **United States Patent**
Yanagisawa

(10) **Patent No.: US 6,519,669 B1**
(45) **Date of Patent: Feb. 11, 2003**

(54) **APPARATUS AND METHOD OF CONNECTING A COMPUTER AND A PERIPHERAL DEVICE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(52) **U.S. Cl.** **710/304**
(58) **Field of Search** 710/301–304; 713/500, 502

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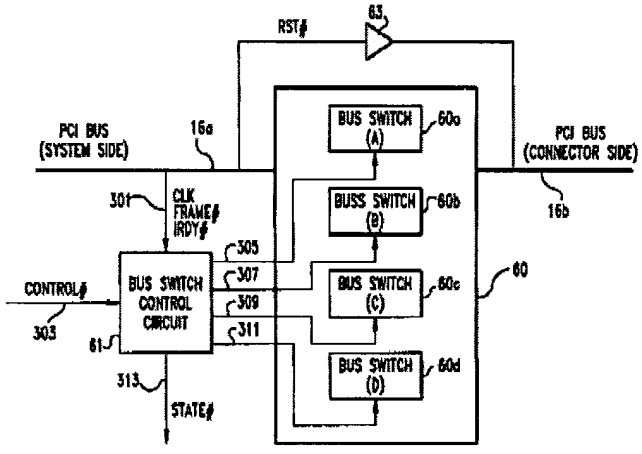
(74) *Attorney, Agent, or Firm*—Douglas W. Cameron; Anne Vachon Dougherty

(57) **ABSTRACT**

The invention provides an apparatus and a method of hot docking/undocking a bus line and a peripheral device of a computer. The bus switch 60 connects and disconnects the bus lines 16a and 16b. The bus switch control circuit 61 generates on line 305–311 a bus switch control signal which responds to a turn around cycle from the signal on the bus line 16a and supplies it to the bus switch. The bus switch is operated to open/close in response to the bus switch control signal. Thus, the bus line 16a is in a turn around cycle in connecting/disconnecting the bus lines 16a and 16b so that the cycle operation of the bus is not affected by a noise accompanying opening/closure.

28 Claims, 14 Drawing Sheets



US-PAT-NO: 6519669

DOCUMENT-IDENTIFIER: US 6519669 B1

TITLE: Apparatus and method of connecting a computer and a peripheral device

---------- KWIC ---------

Brief Summary Text - BSTX (21):

In another mode of this invention, the bus switch control signal is generated in response to the turn around cycle related to the start of an address phase while, in further mode, it is generated in response to the turn around cycle related to an idle state. Because the timing when the turn around cycle is generated varies depending on the kind of a PCI signal, a bus line of various PCI signals can be hot docked/undocked by generating a bus switch control signal at each timing to control the switching device.

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US-PAT-NO: 5867406

DOCUMENT-IDENTIFIER: US 5867406 A

TITLE: Docking device for a portable computer and a method for docking a portable computer to the docking device

---------- KWIC ----------

Brief Summary Text - BSTX (15):

The connection of a docking device for a portable computer with a portable computer is usually performed by a single connector which includes all of the port signals, bus signals, control signals and the like, rather than by discrete connectors provided for the respective cables and devices. The reason for this is that it would be difficult, if not impossible, to manufacture a docking device which enabled mechanical alignment between a plurality of connectors and mechanical alignment between each pin of each connector. For example, in the above described Patent Application No. 4-291028, the docking station and the portable computer are docked utilizing a single connector formed by bundling all of the signals, as shown in FIGS. 19 and 20. Similarly, Patent Application No. 3-273323, Patent Application No. 3-294917, Patent Application No. 4-617, Patent Application No. 4-186411, Utility Model Application No. 3-119220, and Utility Model Application No. 3-127933, in accordance with the drawings attached to each specification, describe a docking device and a portable computer which are docked by a single connector.

Brief Summary Text - BSTX (17):

Those skilled in the art will appreciate from the above description that the connector for connecting the portable computer and docking device includes signals having various characteristics. These signals can be classified into two categories. One category comprises port signals for connection to a keyboard, mouse and CRT, and the other category includes bus signals such as the system bus, PCMCIA control signal, IDE.sub.-- HDD control signal, and FDD signal. One criterion for such classification is that the port signals can be connected or disconnected even in a power-on state (namely an active state), whereas the bus signals cannot be connected or disconnected when active. The reason for this distinction is described below.

US005867406A

United States Patent [19]

Yanagisawa

[11] Patent Number: 5,867,406

[45] Date of Patent: Feb. 2, 1999

[54] **DOCKING DEVICE FOR A PORTABLE COMPUTER AND A METHOD FOR DOCKING A PORTABLE COMPUTER TO THE DOCKING DEVICE**

[75] Inventor: **Takashi Yanagisawa**, Yokohama, Japan

[73] Assignee: **International Business Machines Corp.**, Armonk, N.Y.

[21] Appl. No.: **416,398**

[22] Filed: **Apr. 6, 1995**

[30] **Foreign Application Priority Data**

Jun. 16, 1994 [JP] Japan 6-134124

[51] **Int. Cl.**[6] **G06F 7/30**

[52] **U.S. Cl.** **364/708.1**; 361/683; 361/729; 361/733

[58] **Field of Search** 364/708.1; 361/680–686, 361/726–733; 395/281, 283, 500, 800

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Primary Examiner—Emmanuel L. Moise
Attorney, Agent, or Firm—Andrew J. Dillon

[57] **ABSTRACT**

A docking device for a portable computer includes a body adapted to receive a portable computer. The body encloses a number of electronic components adapted to be connected to a portable computer via a number of signal lines. A connector is provided in the body which mechanically connects the number of signal lines within the body to a corresponding number of signal lines within the portable computer. The docking device also includes a signal connection means interposed between the portable computer and the electronic components for selectively electrically interconnecting the particular ones of the signal lines within the body to corresponding signal lines among the number of signal lines within the portable computer in response to an operating state of said portable computer. A preferred embodiment of the docking device further includes a control means for controlling the selective electrical interconnection of the particular ones of the number of signal lines by the signal connection means. In this preferred embodiment, the control means electrically interconnects the particular ones of the number of signal lines within the body to corresponding signal lines within the portable computer in response to an acknowledgment by the portable computer of a request by the control means to electrically interconnect the particular ones of the number of signal lines.

17 Claims, 15 Drawing Sheets